SuperB Computing

status and goals for the meeting

M. Morandin - INFN/PD
representing the computing group

Perugia - 16 June 2009

Topics

- FastSim
- FullSim
- Fast/Full interfaces
- Production environment
- Software tools

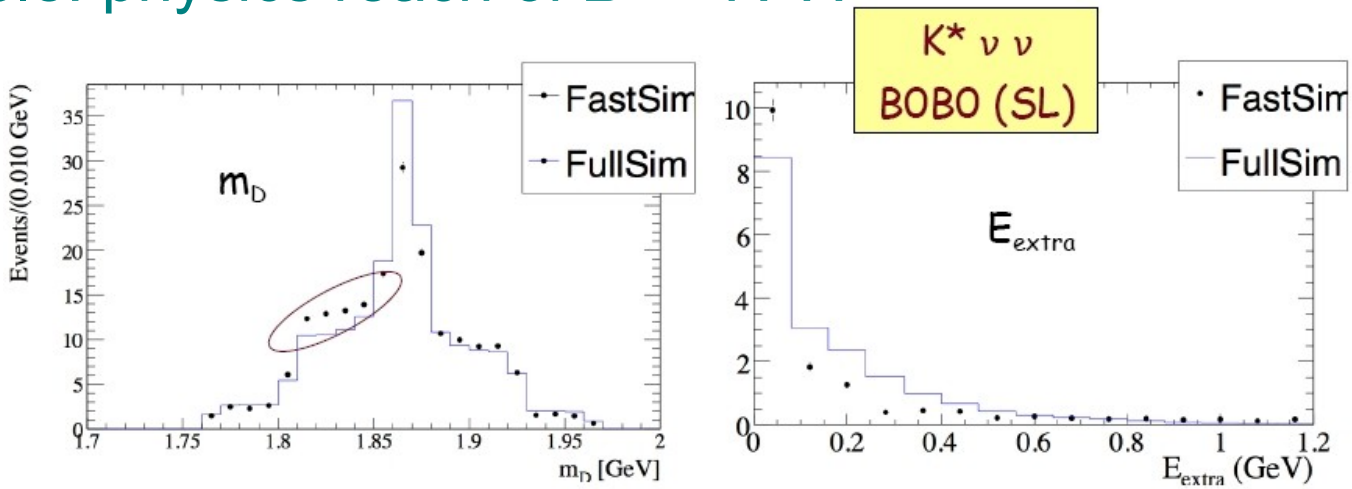
FastSim progress

Progress in all areas

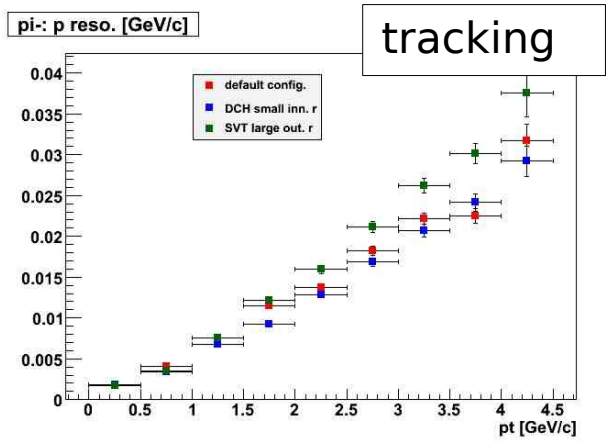
- missing items in February (ongoing development)
  - Hits merging (track hit confusion)
  - dE/dx measurement (DCH)
  - PID selectors
  - Machine bkg mixing
  - Trigger simulation
- developments to improve description of physics processes
  - Improved EM shower simulation
  - N-agon geometry
  - Forward PID alternative systems

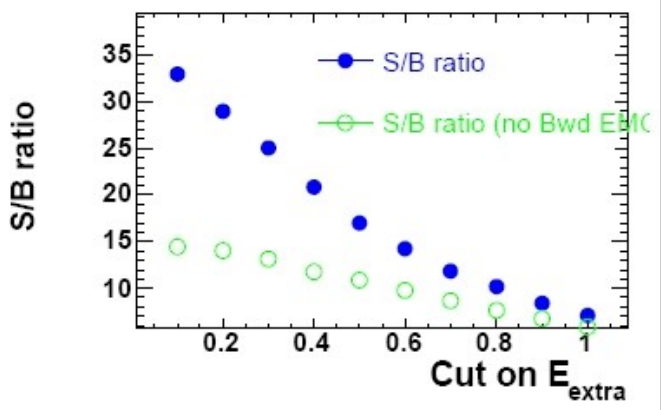
FastSim is being used for physics and detector studies

- Example: physics reach of $B \rightarrow K^{*}\nu\nu$



- Performance comparison of different detector





FastSim goals for this WS

Wednesday 17 June 2009 top

16:00->17:30 **Parallel - Fast Simulation** (Convener: Matteo Rama (*LNF*) , David Brown (*Lawrence Berkeley National Lab*))

Description:

Location: Room TRUMPET 1

16:00	Resolution model for pixels with digital readout (15')	John Walsh (*PI*)
16:15	SVT passive material implementation in FastSim (TBC) (15')	Marco Bomben (*TS*)
16:30	Update on hit merging (15')	Douglas Roberts (*University of Maryland*)
16:45	dE/dx of DCH (15')	Matteo Rama (*LNF*)
17:00	MC truth matching and treatment of loopers (15')	David Brown (*Lawrence Berkeley National Lab*)

- Discussion of technical aspects of FastSim
- Extensive test and validation by the detector and physics groups. Mutual benefit:
  - FastSim is tested and validated with physics and detector studies
  - Users improve their knowledge of FastSim

Full simulation since Orsay

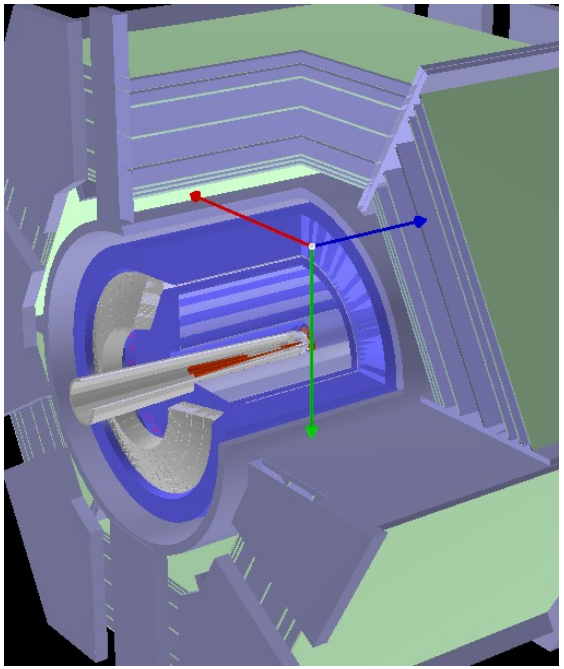
Core developments:

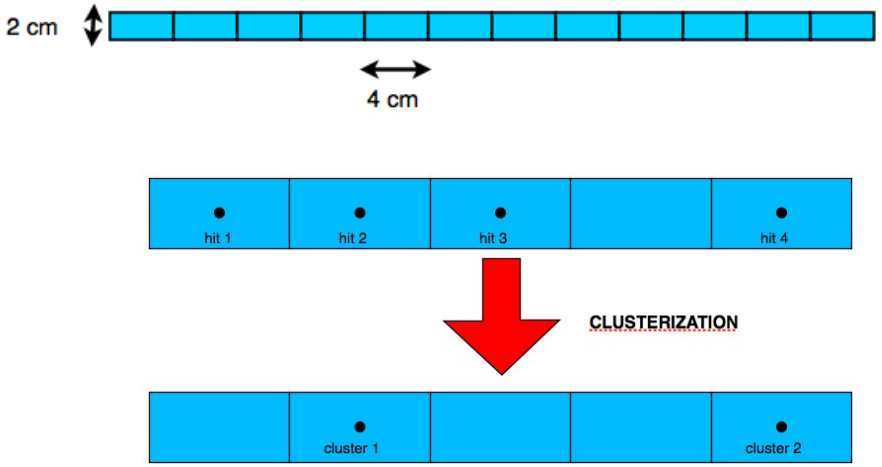
- geometry improvements
- debugging tools available
- single particle generator
- improved documentation:
  - general:
    http://mailman.fe.infn.it/superbwiki/index.php/Geant4_SuperB_simulation_main_portal
  - how to run Bruno at CNAF:
    http://mailman.fe.infn.it/superbwiki/index.php/How_to_run_Bruno_at_CNAF_%28test_setup%29

Detector developments, e.g.: IFR, EMC

IFR Full simulation

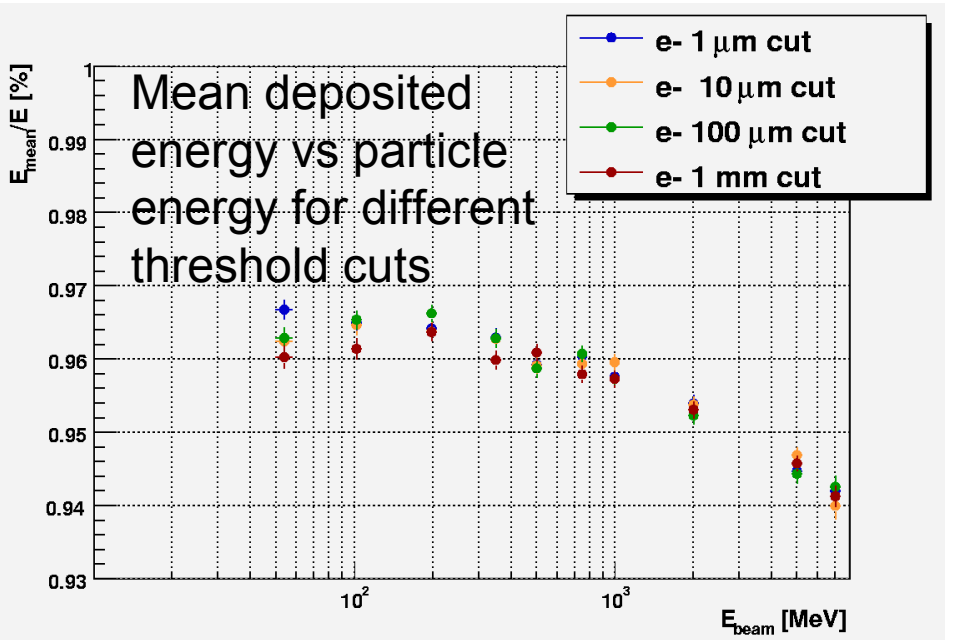
- CDR-like geometry now available
- new digitization which reproduces the scintillator strips geometry (4x2 cm)
- first version of clusterization which associates hits of neighboring strips

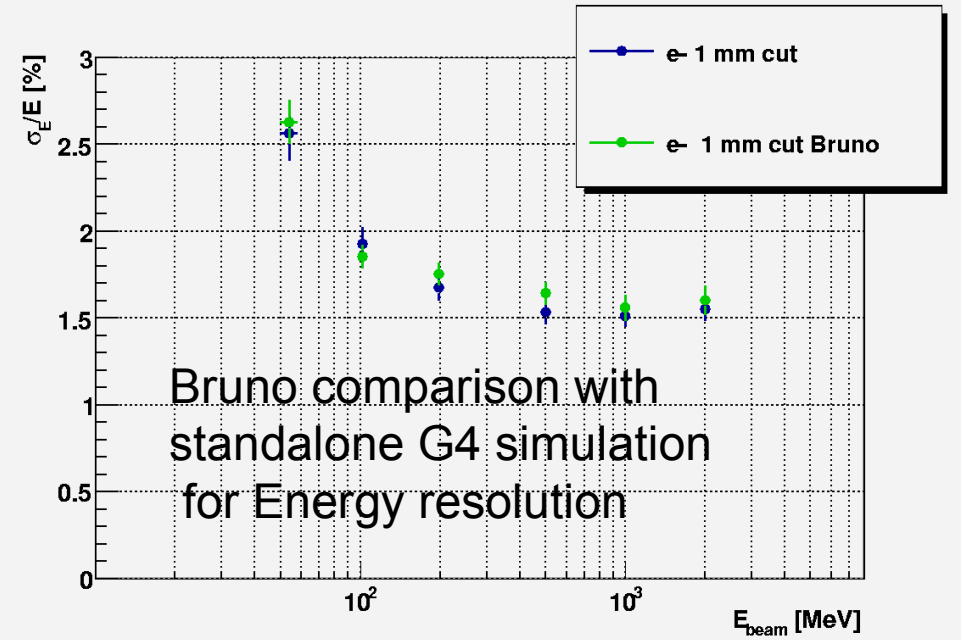




EMC Full simulation

- GDML volumes renaming to allow correct Theta, Phi crystal index reconstruction
- G4 partcicles generation threshold scan to optimize speed without affecting physics
- Bruno comparison with standalone G4 simulation





Full simulation session

Thursday 18 June 2009 top

09:00->*10:30* **Parallel - Full Simulation** (Convener: Fabrizio Bianchi (*TO*))

Description:

Location: Room SAX 2

09:00 Core Developments (15')	Andrea Di Simone (*RM2*)
09:15 Interaction Region (15')	Eugenio Paoloni (*PI*)
09:30 EMC Simulation (15')	Stefano Germani (*PG*)
09:45 IFR Simulation (15')	Mauro Munerato (*PhD student*)
10:00 Hand On Demonstration (30')	

Note the hands-on demonstration at 10 AM

- people interested in learning how to run Bruno should come

Full to Fast simulation interface

Reminder: strategy consists in three steps

- run G4 simulation across all the inner part of the detector (beam pipe, IR, final focus)
- save to file all particles exiting this region, kill G4 tracks to save time
- in a second job, fast-sim reads back the saved particles and propagates them through the rest of the detector

Several progresses done since Paris

- Format of the interchange file was agreed between fast and full sim developers, and both writing and reading back tested
- The “boundary” between full and fast sim has been agreed

Full to Fast simulation interface (II)

- From the full-sim side, everything is ready to start some small production to evaluate computing performance
  - A bug was found in G4, though, and presently things are running using an ugly workaround
- From the fast-sim side, one needs to properly take into account the readout time windows of the different detectors, when doing bkg mixing
  - preliminary version of the code is under test
  - discussion is ongoing on what the best strategy is to deal with event weights

Fast and full simulaton interfaces

Thursday 18 June 2009 top

11:00->*12:40* **Parallel - Fast and full simulation interfaces** (Convener: Andrea Di Simone (*RM2*) , David Brown (*Lawrence Berkeley National Lab*) , Fabrizio Bianchi (*INFN Torino*))

Description:

Location: Room TRUMPET 1

11:00	Background Simulation Overview (20')	Eugenio Paoloni (*PI*)
11:20	Toushek background simulation (20')	Manuela Boscolo (*LNF*)
11:40	Bruno production of background frames (20')	Andrea Di Simone (*RM2*)
12:00	FastSim treatment of background frames (20')	Gabriele Simi (*INFN Pisa, UMD College Park, MD*)
12:20	Discussion (20')	All

Progress on CNAF exploitation

CNAF is the designated site for SuperB public user access

Enabling CNAF for FastSim and FullSim:

- Bruno works at CNAF interactively, via LSF batch system and via Grid submission

  http://mailman.fe.infn.it/superbwiki/index.php?title=Distributed_Computing/CNAF_services
- The FastSim release system and software is installed and configured, need debug/test
- The setup of a FullSim production environment is in progress (estimated time: 1-2 weeks)

SuperB access to GRID VO superbvo.org status

The Virtual Organization superbvo.org distributed in INFNGRID release update 40/41

- all EGEE sites can enable the VO:
  - at present time **INFN Ferrara**, **McGill-lcg2** (S. Robertson) and **CNAF** sites are SuperB VO enabled

The VO setup at CNAF is complete and tested

- 1TB disk space available.
- Three mailing list created to manage Grid user, manager and EGEE interactions.

Production environment

Cooperation with GRID operations group and LHC experiments contacts at CNAF established and fruitful

- selection of services and strategies in various areas has started: production, bookkeeping, grid management and monitor tools (3 students involved):
  - Definition of a **software installation procedure** in Grid
    - procedure complete, optimization phase
  - **Job submission on the GRID**: GANGA evaluation started
  - **Bookkeeping**: initial discussion have started
    - the third meeting took place on June 12th, http://agenda.infn.it/conferenceDisplay.py?confId=1531
    - now testing front-end solutions (AMGA)

special session on physics studies

Wednesday 17 June 2009 top

11:00->*12:30* **Parallel - Physics + Computing** (Convener: David Brown (*Lawrence Berkeley National Lab*))

Description:

Location: Room PRESERVATION

11:00 Breco studies (20')	Elisa Manoni (*PG*)
11:20 Documentation (20')	Adrian Bevan (*Queen Mary*)
11:40 Simulation production resources (20')	Armando Fella (*CNAF*)
12:00 Physics software organization proposal (20')	David Brown (*Lawrence Berkeley National Lab*)

emphasis on production issues:

- e.g.: how to handle the large continuum production that will be needed (persisting physics results, not events)

Software tools status (I)

extracted 189 packages from BaBar release (24.3.5) to build a standalone FastSim SuperB release

- created several SVN code repositories to host these packages which can be used by anybody in SuperB, not just Babarians

successfully built and tested a standalone release (V0.1.0), both on SL/RHEL 4 and SL/RHEL 5

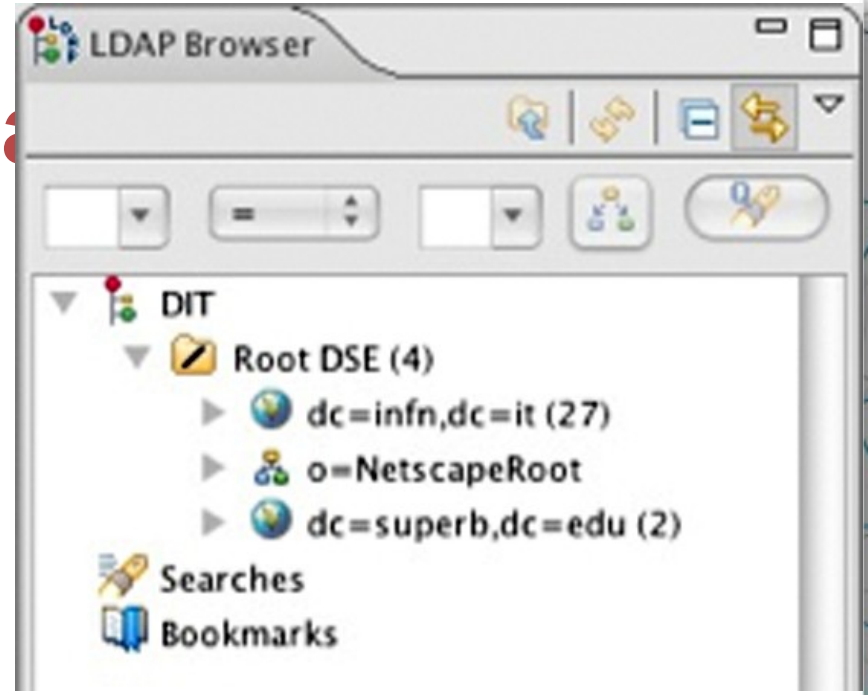
- built rpm packages for the release (for both distributions)

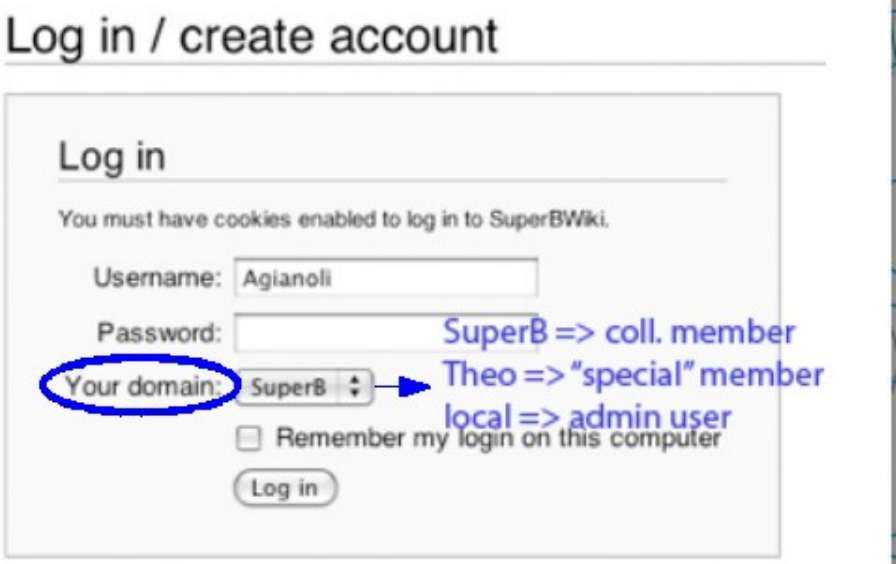
Software tools status (II)

- **created Trac sites** (bug tracking) **for all the repositories**
  - need to use them
- **implemented policies for use of tags in subversion**
- **created a mailing list (superb-repo@lists.infn.it) where all the commits are notified**
  - this is a read-only list
  - all commits are visible, in a more complete way, from the Trac sites

Wiki usa

- request to permit access (r/w) to the wiki to selected “not SuperB” people working on the tech. rep.
  - access needed only for the wiki, not for the code repository
  - it is ok if the access is given for the entire wiki
- new “domain” created inside the wiki, using this new tree
  - final privileges are the same
  - second tree is ignored by other tools (repository, etc.)





towards SuperB computing TDR

SuperB Computing planning group has been reactivated

- group now focused to produce a plan for the R&D phase that will precede the Computing TDR preparation
- preliminary version should be available for discussion at the SLAC October general meeting
  - working documents will by available on a public wiki
- we would like then to publicize it widely within and outside the SuperB group to attract new people interested in taking on the challenges of SuperB computing

final advertisment

- It has been emphasized that efficiency in using computing resources will play an significant role in SuperB,
  - given the foreseeable very large amount of resources involved
- therefore education of young physicists and computer scientists on developing efficient software and systems was felt to be very
- it has been the main reason why we have organized....

First I.N.F.N. International School on

"Architectures, tools and methodologies for developing efficient large scale scientific computing applications"

Centro Universitario Residenziale Bertinoro
Bertinoro (FC)
12 - 17 October 2009

- 1 week, full immersion
  - morning lectures
  - afternoon practical sessions
- 40 students selected among the applicants
- fee all inclusive: 650 Euro all included (500 for INFN personnel)
- web siteis ready to accept applications: **web.infn.it/esc09**

Scientific program (Track1)

Track 1: Design of efficient OO software

- Coordinators: P. Elmer, P. Mato - Lecturers: P. Elmer , P. Mato, L. Tuura, M. Paterno

  - Designing Architectures and Frameworks for HEP
  - Physical software design
  - Basic C++ performance issues
  - Efficient data structures and algorithms
  - Building the software
  - Memory management and use

Scientific program (Track2)

Track 2: Performance in data access with specific regard to HEP experimental data

- Coordinators: F. Furano, A. De Salvo - Lecturers: P. Calafiura, F. Furano , A. Hanushevsky

  - How to Design and Implement an Efficient Data Model: Data Structures and Algorithms.
  - Performant I/O
  - Network I/O and latency

Scientific program (Track3)

- Track 3: **Architectural characteristics of the modern multi-core CPUs and optimization techniques for multi tasking and multi-threading**
  - Coordinators: V. Innocente, S. Jarp - Lecturers: V. Innocente , S. Jarp, A. Lazzaro, A. Nowak
    - Introduction/Setting the scene for why efficient use of modern architectures is important. Review of modern CPU architectures
    - Compiler optimization including efficient programming with SIMD (SSE) instructions
    - Performance monitors for measuring computing efficiency
    - Introduction to multithreading/multiprocessing
    - Overview of multithreading methods
    - Overview of support tools for multithreading, such as Thread Checker and Thread Profiler
    - Exploiting low-cost alternatives to multithreading (KSM, COW), etc.

Application deadline: 31 July 2009

Special evening Lectures:

- Ulrich Drepper - Red Hat - **"Getting it all with C++: Abstraction, Reusability, Performance, and Future-Safety"**
- Raffaele Tripiccione - University of Ferrara/INFN - **"Multicores, GPUs, FPGAs and custom processors for scientific computing: a delicate tradeoff"**
- Domenico Galli - University of Bologna - **"High throughput data transmission through network links"**

Come and/or encourage in particular students and post-doc to come !